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AND THE SCIENCES SUPPORTING PUBLIC HEALTH

SOMEONE CARED
(See Editorial)

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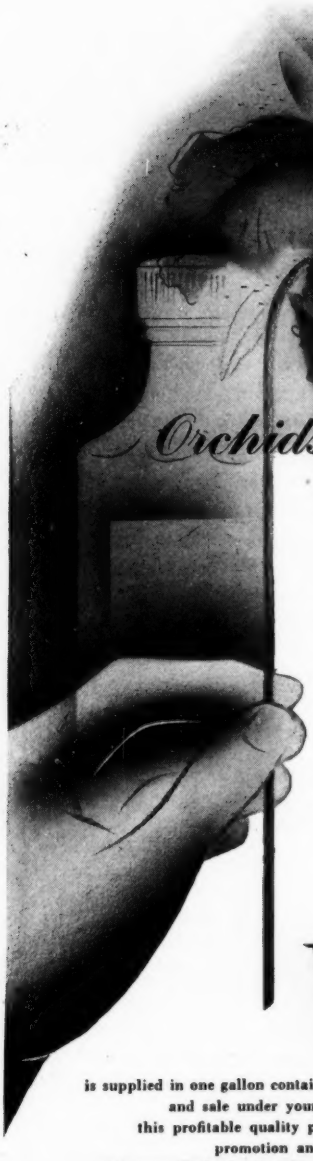

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AMERICAN JOURNAL OF PHARMACY

AND THE SCIENCES SUPPORTING PUBLIC HEALTH

Since 1825

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EDITORIAL

AM I MY BROTHER'S KEEPER?

THE world today is a true example of the chaos that stems from the negative answer to this question. Those who look to force, diplomacy, international agreement and all other means to accomplish world-wide peace and happiness but who disbelieve in the brotherhood of man are guilty of an empty philosophy and are contributing to world disaster.

The United Nations, conceived as a means of promoting world accord and as a safeguard to the dignity of man, is failing today because it has failed to answer truthfully and kindly the questions of the little people of the world; people who were led to believe that equality and security was meant for them that they and their children might live without fear and in peace free to work out their own destiny.

We in the United States are not without blame for we ourselves deprive some of our own citizens the same freedoms which we in the Atlantic Charter promised the world. Furthermore, after the great effort made in World War II we have in Europe at least withdrawn our effort so that it is small wonder that totalitarian ideologies filled the vacuum which was created. The people of Europe are confused. America is enjoying a prosperity that is unprecedented. Never have our people been better fed or clothed, and our national income is growing year by year. Those in the war-weary and devastated countries of Europe find it difficult to reconcile these facts with their own sorry plight and in desperation they clutch at straws hoping that somewhere, somehow, help can be had to ward off the deadly certainty of cold, privation and hunger.

How many Americans really know the torture of continued hunger and cold when no relief is in sight? Even worse, how would we face seeing our children grow thin and die when just a little food would save their lives? To see their wasted bodies fall easy prey to the ravages of disease due to malnutrition? This is not propaganda nor exaggeration. It is Europe today while we complacently gorge ourselves with food and then sleep soundly without even a

twinge of conscience. How can we, and what shall be the result in the end? Shall we ignore the problems of Europe and our responsibilities to mankind? We can for the present if we so choose but we shall live to see ourselves, our children and our children's children suffer terrible consequences. Whether we are Christian, Jew, agnostic or atheist does not alter the situation. Man's inhumanity to man does not go long unpunished for the seeds of retribution are sown by the act itself.

Americans must help those in Europe and now, or it will be too late. How can this best be done? There are those who say "Let the government do it" and thus relieve themselves of any further thought. Of course the government should take immediate action and action is planned but this is not and can not be enough. The problem is so vast that only by having millions of Americans make it a matter of personal responsibility can the issue be met even minimally. Fortunately, a method by which every American can serve has been planned and placed in operation. It is the CARE plan. This is an organization known in full as the Cooperative for American Remittances to Europe, Inc. It is sponsored by twenty-seven major accredited American overseas relief agencies. It is fully approved by the government and is a non-profit organization.

The plan briefly is as follows:

CARE has designed a number of standard packages which are stock-piled in CARE warehouses throughout fifteen European countries. Orders received at CARE's New York office are airmailed to CARE representatives in Europe who make deliveries from packages already there. The senders of CARE packages receive two receipts: one when their order is received by CARE, and one, signed by the recipient, when their orders are delivered. Delivery is guaranteed or money back.

CARE guarantees delivery of its packages in the following countries: Austria, Belgium, Bulgaria, Czechoslovakia, Eire (Ireland), Finland, France, Germany (American, British and French Zones, and all of Berlin), Great Britain, Greece, Hungary, Italy, Netherlands, Poland and Rumania.

Packages may be sent to any person in these countries and if no particular individual is known the donor may designate a classification that is to receive a package, e. g. a "French orphan," a "Czech pharmacist," a "needy Italian family," etc.

For each package send $10 to CARE, 50 Broad Street, New York, with your name and address and the name and address of the recipient.

If millions of packages go to Europe this fall and winter millions of lives can be saved and great suffering spared to many.

Can you not see the tears of gratitude in the eyes of these people on receiving a food or clothing package? They will again have hope since someone cares.

We as Americans have a history of forthright and humanitarian action. Christian ideals and the love of one's fellowman could not let us ignore our plain duty. If we meet this challenge the disillusionment and hatred that suffering brings may be avoided in Europe. In so doing the seeds of yet another war may be destroyed so that peace may again come to the world. It is the duty and obligation of everyone to answer the question posed in this editorial with a firm and resolute "Yes!" May God have mercy on us if we do not.

L. F. Tice.

CONTENTS OF CARE PACKAGES

Standard Food Package	Food Package for Britain[1]
12 oz. Bacon	1 lb. Corned Beef Loaf
1 lb. Braised Beef	12 oz. Bacon
1 lb. Liver Loaf	1 lb. Liver Loaf
1 lb. Corned Beef Loaf	1 lb. Braised Beef
2 lbs. Shortening	2 lbs. Shortening
2 lbs. Sugar	8 oz. Butter
1 lb. Apricots	1 lb. Apricots
1 lb. Raisins	1 lb. Raisins
7 lbs. Flour	2 lbs. Chocolate
2 lbs. Chocolate	2 lbs. Whole Milk Powder
2 lbs. Whole Milk Powder	½ lb. Egg Powder
8 oz. Egg Powder	½ lb. Tea
1 lb. Coffee	2 lbs. Sugar
½ lb. Tea substituted for Coffee in packages for Poland	2—18 oz. cans Fruit Juice
6 oz. Soap	6 oz. Soap
¼ oz. Yeast	¼ oz. Yeast

[1] For delivery in Great Britain only.

KOSHER FOOD PACKAGE[2]

12 oz. Beef Luncheon Meat
15 oz. Beef and Gravy
12 oz. Corned Beef Loaf
2 lbs. Shortening
2 lbs. Sugar
2 lbs. Dry Whole Milk
½ lb. Dry Egg Powder
1 lb. Apricots
1 lb. Prunes
1 lb. Coffee
2 lbs. Chocolate
7 lbs. Flour
6 oz. Soap
¼ oz. Yeast

LAYETTE PACKAGE

12 Gauze Diapers
2 Cotton Receiving Blankets
2 Flannel Kimonos
2 Cotton Training Pants
2 Cotton Shirts
1 Plastic Waterproof Sheet (27 x 36)
6—8 oz. Pyrex Nursing Bottles
6 Nipples
20 Safety Pins
1 bottle Boric Acid (2 oz.)
1 bottle Baby Oil (6 oz.)
1 can Baby Powder (4 oz.)
3 cakes Soap—2 oz. each
1 can Sterile Cotton (4 oz.)

BLANKET PACKAGE

2 New Army Blankets
1 Set Heels and Soles, Women's Shoes
1 Set Heels and Soles, Men's Shoes
1 scoop of Nails for Cobbling
4 spools Thread
1 box Darning Cotton
1 package Needles
1 Thimble
1 pair Scissors
1 Comb
1 pair Shoe Laces
1 card Safety Pins
2 cakes Soap—3 oz. each

WOOLEN SUITING PACKAGE

3½ yds. 100% Wool, 14 oz. 56 to 58 inches Material, herringbone weave
2 yds. Lining
500 yds. Thread
1 package Needles
18 Buttons
1 Thimble
1 pair Scissors
2 cakes Soap—3 oz. each

FOOD PACKAGE FOR IRELAND (EIRE)[3]

2 lbs. Chocolate
1 lb. Butter
2 lbs. Sugar
1 lb. Apricots
2 lbs. Raisins
1 lb. Preserved Fruit
1½ lbs. Canned Peaches
7 lbs. Flour
2 lbs. Whole Milk Powder
½ lb. Egg Powder
3 lbs. Shortening
1 lb. Split Peas
½ lb. Tea
2—18 oz. cans Fruit Juice
¼ oz. Yeast
6 oz. Soap

INFANT FOOD PACKAGE (for babies up to 6 months old)

10 lbs. Whole Milk Powder
18 oz. Infant Cereal Food
100 Tablets Ascorbic Acid (50 mg.)
30 cc. Vitamin A & D Concentrate
2 lbs. Granulated Cane Sugar
6 oz. Toilet Soap
1 Can Opener
1 Tablespoon
1 Teaspoon
1 Measuring Cup

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[2] For delivery in Austria, Czechoslovakia, France, Germany (American, British and French zones and all of Berlin), Great Britain, Hungary, Italy, Poland and Rumania only.

[3] For delivery in Eire only.

BABY FOOD PACKAGE (for babies over 6 months old)

8 lbs. Whole Milk Powder
18 oz. Infant Cereal Food
30 Tablets Ascorbic Acid (50 mg.)
20 cc. Vitamin A & D Concentrate
1 lb. Granulated Cane Sugar
30 Cans Strained Baby Food
6 oz. Toilet Soap
1 Can Opener
1 Tablespoon
1 Teaspoon
1 Measuring Cup

COTTON PACKAGE

4 yds. White Broadcloth
4 yds. Colored Broadcloth
4 yds. Printed Dress Material
2½ yds. Printed Shirting
2½ yds. Navy Drill
1 package Needles
1 pair Scissors
1 Thimble
8 spools Thread
3 dozen Buttons
2 cakes Soap—3 oz. each

HOUSEHOLD LINEN PACKAGE

2 Heavy White Muslin Sheets (81 x 99)
2 Heavy White Muslin Pillow Cases (42 x 36)
1 Turkish Towel (18 x 36)
2 Kitchen Towels (17 x 32)
1 Turkish Face Cloth (12 x 12)
2 cakes Soap—3 oz. each

KNITTING WOOL PACKAGE

2¾ lbs. Hand Knitting Yarn—100% Virgin Wool, in navy blue, tan and maroon
2 Knitting Needles (14 in.)
4 Sock Needles, double point (7 in.)
1 Crochet Hook (size F)
1 Steel Darning Needle
20 Needles
1 Tape Measure (60 in.)
3 yds. Rayon Binding Tape (½ in.)
3 dozen Black Buttons
2 cakes Soap—3 oz. each

AN EXPERIMENTAL STUDY OF THE STABILITY OF CERTAIN FACTORS OF VITAMIN B COMPLEX TOWARD VARIOUS FOOD, DRUG AND COSMETIC COLORS

By Harold C. Epley, M. Sc.,* and Alvah G. Hall, M. Sc.

IT has been known for several years that vitamins of the B complex are readily destroyed by certain chemical agents (alkalis, oxidizing agents and certain metals), and by physical agents (heat and light).

Although vitamins of the B complex are widely distributed in foodstuffs, the losses of certain factors during the cooking, processing and refining of foods have brought about a high percentage of nutritional deficiency states throughout the nation (1). Because of this fact there has been within the last few years, a tremendous increase in the use of vitamin preparations. In view of the enormous "Dollar Volume" of this new field, widespread competition has developed among a multitude of manufacturers and a diversity of products appeared upon the market.

Most vitamins are not prescribed by physicians but are purchased by the general public from pharmacies, drug stores and the drug counters of general stores. "Eye Appeal" has been a large factor in sales promotions. One method of obtaining the "Eye Appeal" has been the use of food colors in the various liquid vitamin preparations.

During the research on "An Experimental Study of the Photochemical Destruction of Pyridoxine Hydrochloride" (2), the author found that certain F. D. & C. colors caused a rapid destruction of pyridoxine hydrochloride in aqueous solution when exposed to diffused daylight. It was thus deemed germane to determine the stability of certain factors of the vitamin B complex toward various synthetic edible food colors. These colors or dyes, certified by the Food and Drug Administration for use in foods, drugs and cosmetics, are commonly known as F. D. & C. colors. This terminology will be employed in this paper.

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* Presented to the Faculty of the Graduate School, the University of Southern California, in partial fulfillment of the requirements for the degree of Master of Science in Pharmacy.

Procedure

Individual vitamin B factors were dissolved in distilled water. The concentrations of the solutions were adjusted to compensate for the sensitivity of the analytical tests employed. F. D. & C. colors were added to obtain a concentration of 100 gammas per cc. The solutions were placed in white glass bottles. The bottles were tightly stoppered and stored at room temperature in diffused daylight. Samples were removed at intervals and assayed to determine the extent of destruction of the vitamin factors.

The method used for the colorimetric determination of thiamin chloride was a modification of Roylin's procedure (3), based upon the reaction of thiamin hydrochloride with 2,6-dichloroquinone-chloroimide in the presence of a solution of borax pH 9.6 and the color determined in a photoelectric colorimeter.

As there were no reports of chemical methods of riboflavin determination in the literature, it was decided to ascertain if riboflavin would give the flavone color reaction with boric acid as observed by Wilson in the case of lemon juice dried in the presence of boric acid (4), inasmuch as riboflavin is chemically related to the flavones and while the formula of riboflavin does not exactly match the configuration for reactivity as postulated by Wilson, it does approach it. Limited studies indicated that this color reaction could be used for the determination of riboflavin in the study although work to determine the adaptability of the reaction to varying conditions was not done.

The color reaction of 2,6-dichloroquinone-chloroimide with pyridoxine hydrochloride in the presence of a veronal buffer (pH 7.6) as adjusted by Scudi was used for the colorimetric determinations of pyridoxine hydrochloride (5).

The colorimetric determination of niacinamide used in this study consisted of the reaction of 2,4-dinitrochlorobenzene and the tertiary nitrogen of the pyridine ring of the niacinamide and the subsequent decomposition of the addition product with sodium hydroxide (6, 7).

Conclusions

It appears that some of the factors of the vitamin B complex, notably riboflavin and pyridoxine, are unstable toward several of the F. D. & C. colors. Thiamin was stable toward all the colors tested except Red #3. Thiamin apparently slowly reacted with

F. D. & D. Red #3, as a red precipitate slowly formed concurrently with the decrease of thiamin in the solution.

Yellow #1 and Green #3 apparently caused destruction of riboflavin while Red #3 and Orange I seemed to protect it from photochemical destruction.

Red #3, Yellow #1, Green #1, Green #3 and Blue #2 apparently caused destruction of pyridoxine. On the other hand, Red #2 and Yellow #5 seemed to give protection from photochemical destruction.

Niacinamide was not affected by any of the F. D. & C. colors tested.

It is, however, recommended that the above work be repeated, using biological or microbiological methods of assay, before definite conclusions are reached because of the possibility of the formation of complex addition products between the colors and the vitamin factors. If this is the case, these products did not react to the tests used in this study. However, they might be capable of being metabolized by living organisms and utilized as vitamins.

The results of this study indicate that there is a great liability toward photochemical destruction of riboflavin and pyridoxine when vitamin B complex preparations of purely synthetic origin are packaged in liquid form. The addition of several of the F. D. & C. colors apparently hasten their destruction. It has also been shown that niacinamide has a destructive action against thiamin (8). However, the starch and protein content of vitamin B complex preparations from natural sources apparently offer a marked degree of protection to some of the vitamin factors (9, 10). It is possible that the addition of amino acids, protein hydrolysates or selected whole proteins would stabilize liquid synthetic vitamin B complex preparations.

Summary

In view of the extreme sensitivity of certain B complex factors to heat, light, chemicals and change in pH, this study was undertaken to determine the stability of certain B complex factors toward various F. D. & C. colors. The results of this study indicate that certain vitamin B complex factors, especially riboflavin and pyridoxine are adversely affected by some F. D. & C. colors and that the indiscriminate use of F. D. & C. colors in liquid vitamin B complex preparations of synthetic origin should be avoided.

TABULATION OF RESULTS

1. Thiamin Hydrochloride

Concentration of Thiamin HCl Solutions (25 Gammas/cc.) containing F. D. & C. colors (100 gammas/cc.) following exposure to diffused daylight.

F. D. & C. Color	Weeks of Exposure		
	3	5	8
Red #2	25	23	26
Red #3	20	9	8
Orange I	23	29	25
Yellow #1	21	23	25
Green #3	25	28	23
Blue #2	25	26	28
Control	25	25	25

2. Riboflavin

Concentrations of Riboflavin Solutions (100 gammas/cc.) containing F. D. & C. colors (100 gammas/cc.) following exposure to diffused daylight.

F. D. & C. Color	Weeks of Exposure	
	1	3
Red #2	77	22
Red #3	88	77
Orange I	66	44
Yellow #1	0	0
Green #3	0	0
Blue #2	22	0
Control (in light)	33	0
Control (in darkness)	100	88

3. Pyridoxine Hydrochloride

1st Series

Concentration of Pyridoxine HCl Solutions (45 gammas/cc.) containing F. D. & C. colors (100 gammas/cc.) after exposure to diffused daylight.

F. D. & C. Color	Weeks of Exposure					
	1	2	4	8	11	18
Red #2	42	44	42	15	18	8
Red #3	7	3	2	0.5	0	0
Yellow #5	37	41	33	27	24	23
Control (in light)	40	41	37	24	13	10
Control (in darkness)	45	44	45	37.5	31	30

4. Pyridoxine Hydrochloride

2nd Series

Concentrations of Pyridoxine HCl Solutions (25 gammas/cc.) containing F. D. & C. colors (100 gammas/cc.) after exposure to diffused daylight.

F. D. & C. Color	Weeks of Exposure		
	2	3	5
Blue #2	17	11.5	4
Green #1	10	5	0.5
Green #3	3	0.5	0.5
Yellow #1	11	5	0.5
Orange I	19	17	13
Control (in darkness)	23	21	16

5. Niacinamide

Concentrations of Niacinamide Solution (500 gammas/cc.) containing F. D. & C. colors (100 gammas/cc.) following exposure to diffused daylight.

F. D. & C. Color	Weeks of Exposure		
	2	5	8
Red #2	504	496	500
Red #3	502	500	498
Orange I	500	498	494
Yellow #1	490	504	502
Green #3	500	494	500
Blue #2	498	490	498
Control	502	498	502

TABULATION SUMMARY

F. D. & C. Color	Thiamin		Riboflavin		Pyridoxine		Niacinamide	
	Time (days)	% of loss	Time (days)	% of loss	Time (days)	% of loss	Time (days)	% of loss
Red #2	56	0%	21	88%	77	60%	56	0%
Red #3	56	68%	21	23%	77	100%	56	0%
Orange I	56	0%	21	56%	35	48%	56	0%
Yellow #1	56	0%	7	100%	35	98%	56	0%
Yellow #5					77	47%		
Green #1					35	98%		
Green #3	56	0%	7	100%	35	98%	56	0%
Blue #2	56	0%	21	100%	35	84%	56	0%
Control	56	0%	21	100%	77	71%	56	0%

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THE EFFECT OF TYROTHRICIN ON FUNGI

By Louis Gershenfeld and Sylvia Brener Averbach *

DUBOS, in 1939, reported the discovery of "tyrothricin," an antibiotic which was obtained from *Bacillus brevis,* a spore bearing soil bacillus (1). Later that year, Dubos and Cattaneo obtained a very active purified protein-free preparation of the crude extract (2). The name tyrothricin is derived from the generic name, *tyrothrix,* employed for several aerobic spore bearing bacteria which yield substances displaying antibacterial activity against microorganisms other than those causing their production (3).

The use of antibiotics in the treatment of fungous diseases of the skin has been limited. Schnumann reported five cases of latent trichophyton infection activated by the use of penicillin (4). Stokes demonstrated the complete inhibition of *Achorion schoenleinii, Microsporium gypseum, Trichophyton gypseum* and *Candida albicans* using tyrothricin at a dilution of 1:5,000 to 1:20,000 (5).

Experimental

Experiments were conducted to observe the effect of tyrothricin on various fungi by the use of the spore germination technique.

The spore germination method is a quantitative procedure for evaluating biological activity and is used by plant pathologists for measuring fungistatic efficiency (6, 7). Five cc. of distilled water are added to a seven day old culture of the test organism. The tube and contents are then rotated between the palms of the hands so as to loosen the spores from the mycelial mat. The spore suspension is poured into a graduated cylinder. Another 5 cc. of distilled water are added to the culture tube and, after rotation, the spore suspension added to the first washing. The total volume is adjusted to 10 cc. with distilled water. A haemocytometer is used

* Department of Bacteriology, Philadelphia College of Pharmacy and Science.

for estimating the density of the spore population. The suspension is then diluted so that a concentration of 500,000 spores per cubic centimeter was obtained. After diluting the spore suspension, a count is made microsopically to check and note the presence of approximately 50 spores per low power field.

In our studies varying concentrations of tyrothricin, hereafter designated as the toxicant, and a definite amount of a spore suspension were added to numbered tubes, the diluent being either distilled water or 2% orange juice. The latter was employed as a spore stimulant (8). The mixtures (toxicant, spore suspension and diluent) in these numbered tubes are referred to as the spore toxicant mixtures (see Table I).

TABLE I

SPORE TOXICANT MIXTURES

Tube number	1	2	3	4	5	6	7	8
Parts per million of toxicant	2	4	8	16	32	64	128	0
cc. of toxicant (conc. 1:1,000)	0.02	0.04	0.08	0.16	0.32	0.64	1.28	0.00
cc. of diluent	8.98	8.96	8.92	8.84	8.68	8.36	7.72	9.00
cc. of spore suspension	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Hanging drop slides were numbered to correspond with the tubes. Exactly 0.1 cc. of each spore toxicant mixture was pipetted into the respective depressions of the slides. Each slide used had double concavities. The diameter of each drop did not exceed 10 mm. The slides were supported on glass tubing in a moist chamber lined with filter paper. The moist chamber was covered, sealed with 20 cc. of distilled water, and incubated at room temperature for 15 to 24 hours. Each lid was lined on the inside with filter paper which was held in place by waterproof adhesive tape. Condensation of water on the lid and subsequent dripping onto the slides during very humid weather necessitated this procedure. The chambers used had an inside diameter of 255 mm. and were 100 mm. in height.

The center of the surface of each drop suspension of the spore toxicant mixtures was examined under the microscope. One hundred spores were counted, taking note of the numbers of germinated and ungerminated spores. A spore was considered germinated if the germ tube was more than one-half the diameter of the spore in length. Clumps of spores were not counted.

Using the following equation, the corrected per cent germination was determined:

$$\frac{\text{Observed germination} \times 100}{\text{control germination}} = \text{Corrected per cent germination.}$$

From this value:

100 per cent germination—corrected per cent germination = per cent inhibition

The following test organisms were employed in this study:

1. *Scleritinia fructicola.* A test organism frequently used by plant pathologists.

2. *Trichoderma* (species). This organism was available at the time of the experiments and was obtained from Army culture number 69.

3. *Aspergillus awamori.* This organism was isolated from a cold cream preparation to which no preservative had been added. It was identified and classified according to Thom (9).

4. *Penicillium* (species). This organism was isolated from the same cold cream preparation which yielded the aspergillus species.

A 0.1% stock solution using defatted tyrothricin powder in 95% ethyl alcohol was prepared. A 0.1% benzoic acid solution in 95% ethyl alcohol was employed as a standard. A control test on the diluent was carried along using 95% ethyl alcohol.

Orange juice solution was used as a spore stimulant in several of the tests (8). Canned, unsweetened orange juice was strained through cheese cloth and filtered through filter paper three times. One cc. ampuls were filled, sealed and sterilized at 80°C. for one hour on three successive days. The orange juice was stored in the refrigerator and, when ready for use, a 2% solution in distilled water was prepared.

Potato dextrose agar (2% agar and 2% dextrose in potato broth) was used as the medium in these experiments on account of its stimulating effect upon the growth of the spores.

All glassware after being washed with water was immersed in chromic acid cleaning solution for one hour, and then rinsed in tap water at least ten times. This was followed by three washings with distilled water. It is essential that even traces of the

chromic acid are removed as it possesses powerful fungicidal activity.

The observations made in these experiments using the spore germination method were as follows:

TABLE II

The Toxic Effect of Varying Concentrations of Tyrothricin, Benzoic Acid, and Ethyl Alcohol on *Scleritinia fructicola* using a 2% Orange Juice Solution as a Diluent (average of three determinations).

Tyrothricin in 95% Alcohol (Ethyl)								Orange juice and spore
Parts per million	2	4	8	16	32	64	128	suspension
Per cent germination	98	95	13	0	0	0	0	100
% corrected germination	98	95	13	0	0	0	0	100
Per cent inhibition	2	5	87	100	100	100	100	0
Benzoic Acid in 95% Alcohol (Ethyl)								Orange juice and spore
Parts per million	2	4	8	16	32	64	128	suspension
Per cent germination	100	100	100	97	94	16	2	100
% corrected germination	100	100	100	97	94	16	2	100
Per cent inhibition	0	0	0	3	6	84	98	0
95% Alcohol (Ethyl)								Orange juice and spore
Parts per million	2	4	8	16	32	64	128	suspension
Per cent germination	100	100	100	100	100	100	100	100
% corrected germination	100	100	100	100	100	100	100	100
Per cent inhibition	0	0	0	0	0	0	0	0

TABLE III

The Toxic Effect of Varying Concentrations of Tyrothricin, Benzoic Acid, and Ethyl Alcohol on *Aspergillus awamori* using 2% Orange Juice Solution as a Diluent (average of three determinations).

Tyrothricin in 95% Alcohol (Ethyl)								Orange juice and spore
Parts per million	2	4	8	16	32	64	128	suspension
Per cent germination	76	64	8	0	0	0	0	100
% corrected germination	76	64	8	0	0	0	0	100
Per cent inhibition	24	36	92	100	100	100	100	0
Benzoic Acid in 95% Alcohol (Ethyl)								Orange juice and spore
Parts per million	2	4	8	16	32	64	128	suspension
Per cent germination	99	97	94	90	85	82	23	100
% corrected germination	99	97	94	90	85	82	23	100
Per cent inhibition	1	3	6	10	15	18	75	0
95% Alcohol (Ethyl)								Orange juice and spore
Parts per million	2	4	8	16	32	64	128	suspension
Per cent germination	100	100	99	100	100	100	99	100
% corrected germination	100	100	99	100	100	100	99	100
Per cent inhibition	0	0	1	0	0	0	1	0

TABLE IV

The Toxic Effect of Varying Concentrations of Tyrothricin, Benzoic Acid, and Ethyl Alcohol on *Penicillium* (species) using a 2% Orange Juice Solution as a Diluent (average of three determinations).

Tyrothricin in 95% Alcohol (Ethyl)								Orange juice and spore suspension
Parts per million	2	4	8	16	32	64	128	
Per cent germination	95	90	38	0	0	0	0	98
% corrected germination	97	92	39	0	0	0	0	100
Per cent inhibition	3	8	61	100	100	100	100	0
Benzoic Acid in 95% Alcohol (Ethyl)								**Orange juice and spore suspension**
Parts per million	2	4	8	16	32	64	128	
Per cent germination	97.5	96	97	88.5	81.5	66	0	98
% corrected germination	99.5	98	99	90	83	67.5	0	100
Per cent inhibition	0.5	2	1	10	12	32.5	100	0
95% Alcohol (Ethyl)								Orange juice and spore suspension
Parts per million	2	4	8	16	32	64	128	
Per cent germination	99	98	98	98	98	98	97	98
% corrected germination	100	100	100	100	100	100	99	100
Per cent inhibition	0	0	0	0	0	0	1	0

TABLE V

The Toxic Effect of Varying Concentrations of Tyrothricin, Benzoic Acid, and Ethyl Alcohol on *Scleritinia fructicola* using Distilled Water as a Diluent (average of two determinations.)

Tyrothricin in 95% Alcohol (Ethyl)								Distilled water and spore suspension
Parts per million	2	4	8	16	32	64	128	
Per cent germination	69	33	2	0	0	0	0	98
% corrected germination	70.5	33.7	2.2	0	0	0	0	100
Per cent inhibition	29.5	66.3	97.8	100	100	100	100	0
Benzoic Acid in 95% Alcohol (Ethyl)								**Distilled water and spore suspension**
Parts per million	2	4	8	16	32	64	128	
Per cent germination	97	97	97	96.5	95.5	6	4	98
% corrected germination	99	99	99	98.5	97.5	6.1	4.1	100
Per cent inhibition	1	1	1	1.5	2.5	93.9	95.9	0
95% Alcohol (Ethyl)								Distilled water and spore suspension
Parts per million	2	4	8	16	32	64	128	
Per cent germination	97	96.5	97.5	98	97	96	93.5	98
% corrected germination	99	98.5	99.5	100	99	98	95	100
Per cent inhibition	1	1.5	0.5	0	1	2	5	0

TABLE VI

The Toxic Effect of Varying Concentrations of Tyrothricin, Benzoic Acid, and Ethyl Alcohol on *Trichoderma* (species) using Distilled Water as a Diluent (average of two determinations).

Tyrothricin in 95% Alcohol (Ethyl)								Distilled water and spore
Parts per million	2	4	8	16	32	64	128	suspension
Per cent germination	90	75	1	0	0	0	0	95
% corrected germination	95	79	1.1	0	0	0	0	100
Per cent inhibition	5	21	98.9	100	100	100	100	0
Benzoic Acid in 95% Alcohol (Ethyl)								Distilled water and spore
Parts per million	2	4	8	16	32	64	128	suspension
Per cent germination	94	98	93	94	81	70	3.5	95
% corrected germination	99	100	98	99	85.5	73.5	3.9	100
Per cent inhibition	1	0	2	1	4.5	26.5	96.1	0
95% Alcohol (Ethyl)								Distilled water and spore
Parts per million	2	4	8	16	32	64	128	suspension
Per cent germination	92	93	92	93	93	94	93	95
% corrected germination	97	98	97	98	98	99	98	100
Per cent inhibition	3	2	3	2	2	1	2	0

Summary and Results

The Fungicide Committee of the American Phytopathological Society regards the spore germination method used in these experiments as determining the fungistatic properties of a chemical substance (7). In general, it involves inhibiting the growth of the fungus or inhibiting the germination of its spores in the presence of a chemical substance.

Spores of different test organisms were placed in varying concentrations of spore toxicant (tyrothricin) mixtures and with benzoic acid (as the standard). The lowest concentrations of tyrothricin required to inhibit spore germination were determined on four species of fungi: *Scleritinia fructicola, Trichoderma* (species), *Aspergillus awamori* and *Penicillium* (species). *Aspergillus awamori* and *Penicillium* (species) did not germinate when using distilled water as a diluent. *Scleritinia fructicola* and *Trichoderma* (species) germinated satisfactorily using the same diluent. A two per cent orange juice solution used as a diluent stimulated germination, resulting in germination of *Aspergillus awamori* and *Penicillium* (species) and increased germination of *Scleritinia fructicola.*

Under the conditions of these tests, the following results were obtained:

a. Using water as a diluent: Complete inhibition of the spore germination of *Scleritinia fructicola* and *Trichoderma* (species) was produced by a dilution of 16 parts per million of tyrothricin.

One hundred and twenty-eight parts per million of the standard benzoic acid inhibited spore germination of (1) *Scleritinia fructicola,* 96%, and (2) *Trichoderma* (species), 96%.

The control, 95% ethyl alcohol, did not produce more than 5% inhibition in any of the dilutions used on the test organisms.

b. Using 2% orange juice solution as a diluent: Complete inhibition of the spore germination of *Scleritinia fructicola, Aspergillus awamori* and *Pencillium* (species) was produced by a dilution of 16 parts per million of tyrothricin.

One hundred and twenty-eight parts per million of the standard benzoic acid inhibited the spore germination of (1) *Scleritinia fructicola,* 98% (2) *Aspergillus awamori,* 75% and (3) *Penicillium* (species), 99%.

The control, 95% ethyl alcohol, did not produce more than 1% inhibition in any of the dilutions used on the test organisms.

Conclusions

Employing the spore gemination method in the measurement of the fungistatic activity of tyrothricin, this antibiotic revealed fungistatic properties at high dilutions. Growth of *Sclertinia fructicola, Trichoderma* (species) *Aspergillus awamori* and *Penicillium* (species) was inhibited completely by a solution containing 16 parts per million of tyrothricin.

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MEDICINE AND PLANT EXPLORATION*

By Ralph Holt Cheney [1] and Benjamin L. Milana [2]

AMONG the dozen most important drugs employed in modern medicine, more than half of them are derived from plant sources. In addition, the keys to a large number of the synthetic compounds used therapeutically were discovered by a study of the plant principles produced by natural metabolism.

The pharmacopoeias of the world vary from a few pages with less than 100 botanic drugs listed to the Chinese pharmacopoeia of several volumes including hundreds of plant species. The history of botany, pharmacy and medicine reveals that the sources and uses of these drugs have been discovered in many interesting ways—often, as stories about such drugs as digitalis, quinine, cocaine, strychnine, curare, ouabain and strophanthin reveal, accomplished by dramatic experiences. Some medicines were an incidental by-product of expeditions for conquest, colonization, or religious conversion. Others were the direct result of the activity of botanists or physicians—or both—assigned for the specific purpose of plant investigation as a part of a general expedition, or a group organized especially for plant exploration.

Incentive for a Russian Botanical Garden

There has been one instance, at least, in which an interest in medicinal plants actually preceded plant exploration rather than the reverse. In 1714, Peter the Great of Russia ordered a medicinal plant garden to be laid out in one of the islands of the Neva River. It was called the Apothecaries' Garden and the island is still referred to as Apothecaries' Island. In 1716, Peter the Great visited the botanist Breynius in Danzig and requested him to recommend a botanist to explore the natural productions of Russia. Breynius proposed Messerschmidt, who traveled from 1720 to 1727 in Siberia and made vast collections, especially in the eastern region, of re-

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putedly medicinal and other plants. Upon the order of Alexander I, this Apothecaries' Garden in 1823 became the Imperial Botanic Garden under the directorship of Friedrich Fischer, who is regarded as the founder of the Botanical Garden of St. Petersburg, now Leningrad.

Bitter-wood, Sassafras, and Rhatany

The plant journeys of individual botanists have been responsible for many of the drug plants cited in the official list recognized by the United States Pharmacopoeia XII and in the National Formulary VII. For example, bitter-wood (*Picrasma excelsa* and *Quassia amara,* both of the Simarubaceae or Ailanthus family) is a bitter tonic and pinworm remedy in the form of an enema. It was introduced originally into Europe by the botanist Dahlberg, a pupil of Linnaeus. Occasionally a general explorer and plant collector has introduced a species of some medicinal significance. In 1602, Bartholomew Gosnold commanded the expedition ship *Concord* chartered by Sir Walter Raleigh. He sailed along the coast of New England and carried what must have been the "first export cargo from Massachusetts to England" in the form of ague-tree bark (*Sassafras albidum* of the Lauraceae). This perspiration-inducing agent was used by Seminole Indians in Florida before the adventure of Ponce de Leon in 1502. This plant is also the source of one of the chief aromatics in such popular soft drinks as root beer, birch beer, and sarsaparilla. Peruvian rhatany (the root of *Krameria triandra* of the Leguminosae) was introduced into Spain by the botanist Hipolito Ruiz. During his travels in Peru, he observed native women using it as an astringent and tooth preservative. A similar and also official species, *Krameria argentea,* now comes from Brazil.

Often, an all-purpose governmental expedition has included one or more botanists for plant exploration. In 1852, the United States sent two naval expeditions to eastern Asia. The first was commanded by Commodore Perry and had aboard Dr. Wells Williams and such other plant collectors as the American surgeon, Charles Frederick Fahs, Daniel S. Green and James Morrow. Their collections were identified by Dr. Brott, Daniel E. Eaton, W. G. Sullivant and Dr. W. Harvey. The second expedition took along the botanist Charles Wright. These explorations, and also such travels

as Robert Fortune's journeys in China, re-introduced for further studies such known medicinal plants as species of *Rhamnus* (cascara) and *Aconitum autumnale* and *A. chinense.*

The botanico-pharmacognostic exploration undertaken by Dr. H. H. Rusby, for 42 years Honorary Curator of Economic Collections at the New York Botanical Garden, and by others for Parke, Davis and Co., in 1885, led to the discovery in South America of an abundant supply of *Rhamnus Purshiana* which yields the official cascara sagrada. According to tradition, cascara bark was known to the early Spanish priests of California. It was introduced into general use in 1877 and has been a favorite tonic laxative all over the world ever since. Dr. Rusby's trip also led to the discovery and collection along the Mapiri river (Andean slope of Bolivia) of cocillana (the bark of *Guarea Rusbyi* of the Meliaceae or Mahogany family) used by the natives as an emetic and introduced into U. S. medicine in 1886 as a nauseant expectorant, similar to ipecac. It is no longer officially recognized in either the U. S. P. or the N. F. but is advertised widely today as an ingredient in certain cough drops.

There are at least 35 or 40 minor drugs obtained from plants with which our ancestors became familiar through their contacts with the North American Indians. These drugs, however, can not be said to have been introduced as a direct result of plant exploration, although our colonial botanists and physicians were always on the outlook for the native plants possessing medicinal value.

The Search for a Cure for Leprosy

More ancient than the Bible is the dread disease of leprosy. Prescriptions for its treatment are known in the Egyptian records in 1500 B. C. In the middle of the 19th century, British doctors in India became aware that the Burmese and Bengalese used the seeds of an unknown tree which had some really beneficial effect in the treatment of leprosy. Seeds were obtained and their oils and acids studied by the Wellcome Research Laboratory in London and by Frederick Power of the United States Department of Agriculture. Dr. Dean and his associates in the leper receiving stations in Honolulu and Molokai used the oils with apparent success. The question was imperative. What tree of the jungles bore these seeds? The markets of Benares and Rangoon obtained chaulmoogra or kalaw

seeds from the tribesmen of the upper Chindwin district of northeastern Burma.

In 1920, the U. S. Office of Foreign Seed and Plant Introduction sent out the Agricultural Explorer, Joseph F. Rock. In Bangkok, the capital of Thailand (Siam), Rock found an avenue of *Hydnocarpus* trees which the natives called MAIKRABO. These trees possessed oils similar to the chaulmoogra. At the suggestion of Princess Bovardej of Siam, with whom he was dining, Rock found abundant *Hydnocarpus* near Korat in eastern Thailand. Later, Rock found the true chaulmoogra tree, *Taraktogenos Kurzii* near Kyokta village in the Chindwin district of Burma. Although some patients react anaphylactically to parenteral injections of chaulmoogra and some patients are said not to remain cured, others who are qualified to speak deny this claim of the temporary nature of the effect. Although some leprologists have dropped the traditional chaulmoogra oil treatment as worthless, there is much evidence that it is beneficial. The oil is also used for other purposes and the trees are now grown by the United States in Hawaii, the Philippines and in Florida.

Quinine in the Recent World War

In 1942, when the quinine source of the world was suddenly cut off by the invasion of the Dutch East Indies by the Japanese, the U. S. Board of Economic Warfare (now the Office of Foreign Economics Administration) undertook negotiations to buy all the *Cinchona* bark above a certain minimum alkaloidal content, from the Andean Republics which were the world's quinine source a century earlier. The Cinchona Missions in South America were organized. American botanists, including W. C. Steere, F. R. Fosberg, W. H. Camp, and others, relocated and identified the several species in the forests of northwestern South America. These species included the lesser known *C. pitayensis* which is unusually rich in alkaloids for a wild type *Cinchona*. It averages 3% and ranges up to over 5% in total alkaloids. Chemists analyzed the barks in the Cinchona Mission Laboratories which were operated in Bogotá, Quito, Lima, and La Paz.

This official botancial exploration resulted also in the revival of the use of the quininiferous bark known as "cuprea bark" from *Remijia pedunculata* as a source of the medicinal quinine. This species was re-discovered on the west slopes of the eastern Andes,

north of Bucaramanga. Its bark yields up to 3% quinine sulphate and with very little admixture of other alkaloids. This bark has been known for its quininiferous content for many years, according to the Flückiger account of shipments of over 3,000 tons of cuprea bark (*Remijia*) to London in 1881. Therefore, although it was not a species new to science, the availability of this most important malaria-control drug during the emergency period of World War II was made possible through the direct efforts for this purpose of plant exploration conducted by the U. S. government. Resulting analyses have brought to light some significant physiological distinctions between botanical species, varieties and forms not previously suspected.

More Exploration Needed in Interest of Human Health

Constant support of future plant explorations should be encouraged under public and private auspices interested in the therapeutically active principles produced by the metabolism of vegetation. History indicates that such investigations would result undoubtedly in the discovery of some new drugs and in the selection of more efficacious homologues of known drugs for the alleviation of human disease.

SELECTED ABSTRACTS

The Possibility of Toxic Effects From 2,3-Dimercaptopropanol in Conditions of Impaired Renal or Hepatic Function. G. R. Cameron, F. Burgess and V. S. Trenwith. *Brit. J. Pharmacol. 2,* 59 (1947). Toxic effects from overdosage with 2,3-dimercaptopropanol (BAL) have been reported by other investigators. Inasmuch as severe renal or hepatic damage may be present in either arsenical poisoning or in the conditions for which arsenic is administered therapeutically, it appeared to be of interest to determine whether the toxicity of BAL is enhanced when it is given under such conditions.

Experiments were conducted on rabbits and rats in which severe renal disease was induced by the subcutaneous injection of uranium acetate, and on rabbits with hepatic damage produced by the subcutaneous injection of carbon tetrachloride.

In their response to large doses (from 60 to 120 mg./Kg.) of BAL animals with renal damage did not differ from normal controls. A lowered, but not pronounced, tolerance to BAL was noted in the presence of complete or almost complete failure of renal function. The authors conclude that severe renal disease does not appear to be a contraindication for BAL.

The administration of BAL to animals with hepatic damage resulted in toxic symptoms or death in some instances, although the dosage level was considerably lower than that which was fatal for normal animals. The authors suggest that care should be exercised in the administration of BAL to patients suspected of impaired liver function.

"Gammexane" and Mosquito Control. G. D. Davidson. *Brit. Med. J.* No. 4506, 681 (1947). Field trials of the insecticide gammexane in small native villages situated in Sierra Leone, West Africa, met with considerable success in controlling the adult mosquitoes *A. gambiae, A. melas, and A. funestus.*

The use of small smoke generators containing the insecticide proved ineffectual, but later trials of a residual spray applied to the interior walls of the houses resulted in a significant reduction of the numbers of mosquitoes for periods varying from one to six months, depending on the rate of application, the thoroughness of treatment, and the proportion of any one area treated.

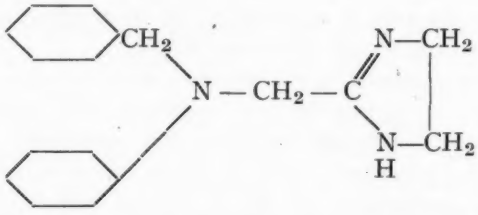
Satisfactory results were obtained with kerosene solutions of the chemical, water-miscible oil mixtures, and water-dispersible powder mixtures, although the form last mentioned was less persistent than the other two. The optimum concentration appeared to be 10 mg. of gammexane per sq. ft. of wall surface, its persistence comparing favorably with that claimed for DDT applied at a rate of 100-200 mg. per sq. ft.

Allergy and Antihistaminic Substances. A. R. G. Chamings. *Pharm. J. 105,* 83 (1947). The term "allergy" was coined by Von Parquet in 1906, being derived from two Greek words meaning "other energy," and indicating an "altered capacity to react." The view generally held by European investigators at present is that the allergic state results from the exposure of an individual to the antigen, followed by the formation of antibodies. The presence of the latter causes the organism to react to subsequent contact with the same antigen in a different manner from that which occurred at the first exposure. The later reaction is usually more rapid and intense than the first.

In 1910 Dale and Laidlaw noted the similarity between the manifestations of anaphylactic shock and the action of histamine, and continued study appeared to indicate that the production of the latter in the system was indeed the cause of this condition.

This led to a search for anti-histaminic agents. The use of histamine in a conjugated form as an azo-protein and the administration of the enzyme histaminase met with only limited success. Later investigations were concerned with such amino-acids as are known to possess histamine-inhibiting properties, and most recently with a group of synthetic compounds, most of which are chemically related. Among these are Antergan and Neoantergan (Rhône-Poulenc), Benadryl (Parke Davis), and Pyribenzamine and Antistin (Ciba).

The last-named substance is the most recent of the anti-histaminic agents. It is 2-phenyl-benzyl-aminomethyl-imidazoline, and has the following structure:



Antistin is stated to be relatively non-toxic and to have in therapeutic dosage a wide margin of safety and freedom from side effects.

Heat Changes in Dextrose Saline. T. A. Hudson and L. Tarlowski. *Pharm. J. 104,* 451 (1947). The changes in pH which solutions of dextrose in normal saline solution undergo on autoclaving were studied under varying conditions of time and temperature. Solution *A* contained 5 per cent of anhydrous dextrose; Solution *B,* 5.5 per cent of dextrose monohydrate. The concentration of sodium chloride was 0.9 per cent in each case, and each solution was prepared immediately before sterilization, freshly distilled water being used exclusively.

After filtration through a British Berkefeld filter at a temperature below 20°, a pH of 6.54 was observed for *A,* and 5.77 for *B.* Autoclaving at 115° for periods of time ranging from 15 to 75 minutes produced a marked lowering of the pH of both solutions, the lowest values resulting from the longest periods of heating. The pH of *A* was 4.77 after 15 minutes of such treatment, and 4.48 after 75 minutes. The corresponding pH values for *B* were 4.92 and 4.56.

It was noted that when samples were autoclaved for 45 minutes at 105°, the pH of *A* was 4.74 and *B* 4.92. Increasing the temperature to 120° for the same length of time produced pH values of 4.46 for both solutions. Intermediate pH values were noted following the use of 110° and 115° temperatures.

Data not differing significantly from the foregoing are also reported for solutions autoclaved for 15 minutes at 120°, 30 minutes at 115°, and 45 minutes at 110°.

It was observed that the pH of samples sterilized by filtration decreased on storage at room temperature for several days, *e. g.*, diminishing from an initial value of 6.48 to 6.04 in six days.

Caronamide for Increasing Penicillin Plasma Concentrations in Man. J. W. Crosson, W. P. Boger, C. C. Shaw and A. K. Miller. *J. A. M. A. 134,* 1528 (1947). Various methods for maintaining high plasma concentrations of penicillin have been studied by numerous investigators. Normally, approximately 80 per cent of penicillin in the urine is excreted by the renal tubules and only about 20 per cent by glomerular filtration. Athough iodopyrin injection ("Diodrast") and p-aminohippuric acid have been successfully used to suppress the excretion of penicillin by the tubules, they have the disadvantage of necessitating large doses by intravenous administration.

The present paper reports the observations made on small groups of patients who received caronamide (4′-carboxyphenylmethanesulfonanilide) orally, concomitantly with penicillin administered either orally or intramuscularly in isotonic sodium chloride solution or in beeswax and oil. Each patient was studied during (a) a preliminary control period of 48 hours during which he received only penicillin medication, (b) a drug-treatment period of 48 hours in which both penicillin and caronamide were given, and (c) a post-treatment period of 48 hours in which only penicillin was administered. Thus, each patient served as his own control in two periods.

It was noted that caronamide in doses of 1.5 gm. every 3 hours or 2 gm. every 4 hours produced a twofold to sevenfold enhancement of penicillin plasma concentration when the two drugs were administered concomitantly. No evidence of systemic toxicity was noted in the series of cases upon which this report is based. Additional clinical studies are now in progress.

Vitamin D ("Ertron") Therapy in Arthritis. Treatment Followed by Massive Metastatic Calcification, Renal Damage and Death. P. Kaufman, R. D. Beck and R. D. Wiseman. *J. A. M.*

A. 134, 688 (1947). The authors present a report of a case in which vitamin D intoxication followed the long-continued use of a high potency preparation by a middle-aged adult, with ensuing death. The diagnosis was confirmed by the findings on autopsy.

During an earlier hospitalization the patient had been treated for a rheumatoid arthritis of thirteen years' duration. Prior to her second admission and upon the advice of another physician, she had been taking vitamin D ("Ertron") capsules in a total daily dosage of 150,000 to 200,000 units for a period of about fourteen months.

The patient's condition upon readmission and laboratory data are presented in detail. Massive calcinosis and extensive renal damage were present. Death from uremia followed in about two months. The gross pathologic observations showed massive calcification involving several joints, soft tissues, lymph glands, and the renal and iliac arteries. Microscopic examination revealed extensive deposits of calcium in the myocardium, lungs, parathyroid glands and pancreas, in the tubules and glomeruli of the kidneys, and in the bronchial epithelium.

The authors point out that large doses of high potency vitamin D preparations may be dangerous, especially if noncontrolled self-medication is practiced.

BOOK REVIEWS

The American Illustrated Medical Dictionary. By W. A. Newman Dorland with the collaboration of E. C. L. Miller. 21st edition, 1660 pages. W. B. Saunders Co., Philadelphia and London, 1947. Price: $8.00 without thumb index; $8.50 with thumb index.

The "Dorland" Medical Dictionary has long been one of the standard works in all those fields embraced by medical science. Terms used in medicine, surgery, dentistry, pharmacy, chemistry, nursing, veterinary medicine, etc., are incorporated in this extensive work. Not only are concise definitions given but also the pronunciation of each word is presented using an easily understood system. The Latin, Greek or other source of various words are also included which is quite helpful to those who attempt to understand word origins.

The rapid advances in medicine and medical technology in the past few years make new editions of medical dictionaries quite necessary if students and practitioners are to have available a source of definitions for the hundreds of new terms and words that have found their way into the literature. A casual reference by the reviewer showed that a test group of words that might be considered relatively new had been included with but few exceptions. Thus neither psychopinesis nor Neo-antergan were found but B. A. L., radioiodine and fibrin foam were defined.

The thousands of students now engaged in medicine, dentistry and pharmacy will undoubtedly find the American Medical Dictionary an indispensable aid in their studies and practitioners will find it a useful reference in their libraries.

Credit is due the publishers for the excellent job of printing and binding, a feature all too uncommon in many books during the past few years.

L. F. Tice

Biological Symposia—Vol. XII—Estimation of the Vitamins. 531 pages edited by Jaques Cattell. Ronald Press Co., New York. Price: $6.50.

The quantitative determination of the several vitamins is an important activity of the many workers in the fields of pharmaceutical control and research. Great progress has been made in the last decade in the development of assay methods for the various vitamins. Early biologic assays were so crude that the term quantitative could scarcely be applied to them. Today biologic assays, *e. g.* the microbiological procedures, are quite reliable and widely accepted and many of the curative tests after vitamin depletion are so refined that they are truly quantitative. Physico-chemical assays, first applied to vitamins in the Carr-Price method for vitamin A, have been developed for many of vitamins giving very precise results.

This, the twelfth volume of Biological Symposia, is a collection of authoritative papers on each of the important vitamin assays written in each case by recognized experts in the field. Each paper is of particular interest since it discusses not simply the method in broad terms but refinements in technic that should be of utmost interest to those who wish to become proficient in a given assay method.

All of the recognized vitamin assays are carefully presented and it is surely a book that deserves a place in every reference library servicing the biochemist, and those engaged in vitamin control and research.

L. F. Tice

Two Blades of Grass—A History of the Scientific Developments in the U. S. Department of Agriculture. By T. Swann Harding. University of Oklahoma Press, Norman, Okl. Price: $3.50.

Those who are familiar with the writings of T. Swann Harding will know better than to catalogue this book as a dry and dusty historical treatise. Nothing could be further from truth.

The title of the book would seem to have no bearing on the contents but this is a common Harding device. Actually the reader soon sees the connection with the title which is both apt and a

stimulus to the imagination. It stems from a sentence in the annual report of Isaac Newton, first Commissioner of Agriculture, who in 1836 wrote: "It should be the aim of every young farmer to do not only as well as his father but to do his best; 'to make two blades of grass grow where but one grew before.' "

The author has been a member of the Department of Agriculture since 1910 with the exception of the years 1918-22. He has always been especially interested in the early years of the Department, just as he was in visualizing the overall activities and accomplishments of this great government sponsored group of scientists. Probably no other person in its history has had the broad view of its contributions to the farmer and to this nation's economic wealth as has Mr. Harding. The book attempts to show how the many scientists, usually unheard and unsung, have enriched our soil, fought plant and animal diseases, increased crop yields and raised farm revenues. Many other activities not usually thought of as stemming from the Department of Agriculture are also described in their contributions to our national welfare.

Were this book simply a chronologic list of achievements it would be impressive. Were it written by one of the Department's research workers it would likely be dull. Harding, who possesses the unusual quality of making statistics and facts interesting and even humorous, has rendered the Department of Agriculture a real service in providing a book of its activities that people will read with enthusiasm. The book not only sells the reader on the value of government research but it is a literary achievement as well. The author might well advise certain other government agencies in how to improve their public relations.

L. F. Tice

Essentials of Pharmacology. By F. K. Oldham, F. E. Kelsey and E. M. K. Geiling. 440 pages incl. index. J. B. Lippincott Co., Philadelphia. Price: $5.00.

To one acquainted with the large comprehensive treatises on pharmacology such as the Goodman and Gilman or the Sollmann this small volume may at first glance seem very brief. Closer persual will lead to a most favorable impression of the excellence of its style, its completeness and its coverage of the latest drugs.

The authors admittedly neither attempted to cover all of the theories of drug action nor to discuss all the finer points of the subject. A book which does this is not as useful to the student of the fundamentals of pharmacology as one written in more condensed fashion. This text would appear to be excellent for students of pharmacy, nursing, veterinary medicine and dentistry. It may be slightly too abridged for the medical student but still a good companion volume to a more elaborate text.

The presentation of the subject matter is unusually clear and very modern. The titles of the U. S. P. XIII are those used for such drugs and metric doses are given. One is surprised to find almost every important new drug mentioned in the text, *e. g.*, diisopropyl fluorophosphate, the nitrogen mustards, propylthiouracil, paludrine, nitrofurazone, folic acid, pyribenzamine, etc.

References to original papers at the end of each chapter are very helpful and they can serve as useful collateral reading.

The only criticism that the reviewer can find is the book's brevity. This may not in all instances be a disadvantage, particularly if the time allotted to a course in pharmacology is necessarily limited.

Air Conditioning. By Herbert Herkimer and Harold Herkimer. 692 pages. Chemical Publishing Co., Inc., Brooklyn, 1947. Price: $12.00.

The book does everything that the authors claim it should. That is, it provides required information on every phase of air conditioning. Only an engineer with many years of actual experience could write such a complete piece of work as Herbert Herkimer, with thirty-five years of experience, has done. Much valuable information has been selected and used from The American Society of Heating and Ventilating Engineers, The American Society of Refrigerating Engineers, and representative manufacturers' technical literature. Harold Herkimer is to be congratulated for the general arrangement of the book.

The material is written in an interesting manner and should make an excellent text for students of air conditioning as well as being a source of information for men in the field.

From the point of view of a physicist, the necessary theory is very well presented. No previous knowledge of physics nor ad-

ditional material other than that given by the authors should be needed. One negative criticism might be that some of the diagrams are not explained sufficiently. All terms are well defined, the working equations are made clear, and many practical problems are worked.

Not only have the authors given theory, actual installation procedures, recommendations of best materials to use, how to estimate costs, but have included a most interesting and important chapter—Elements of Health and Comfort.

ROBERT N. JONES

Laboratory Exercises in Inorganic Chemistry. By W. Norton Jones, Jr. 315 pages, with 20 illustrations. The Blakiston Company, 1012 Walnut Street, Philadelphia 5, Pa., August, 1947. Price: $2.25.

This new manual for a first-year course in college chemistry is in two parts. The first part consists of 100 pages, containing 50 exercises with clear and concise directions to the student for his laboratory work. The second part is made up of detachable sheets with printed questions to be used with the 50 exercises of Part 1. These question sheets give the students something definite to answer and at the same time are a timesaver to the instructor.

The material covered is the usual run of experiments beginning with the properties of substances, then the laws of physics and chemistry and finally work with the non-metals and metals.

The set-up of the entire manual is good (the printing is in column form) and any student following the exercises conscientiously will have a good foundation for future chemistry courses.

C. C. PINES.

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